Meet the Challenges of the Fehmarnbelt Fixed Link

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Abstract

This paper presents an alternative TBM tunnel solution for the Fehmarnbelt Fixed Link, based on two new concepts for the construction of tunnels: the TMG concept for rail tunnels and the TMF concept for road tunnels. The application of these concepts in the project allows a solution that, in addition to low environmental impact (which is typical of the TBM tunnels), have improved safety during operation and very low cost.

Keywords: Tunnels; Fehmarnbelt, TBM, Railways, Roadways, TMG, TMF

1 Introduction

The Fehmarnbelt Fixed Link is a Danish-German project, in the Baltic Sea, providing a direct link by rail and road between the two countries. It will be owned and financed by Denmark and to be repaid by the users. It is part of the expansion of the Trans-European Transport Network of the European Union (TEN-T), being co-financed by EU funds. It is being managed by Femern A/S, a Danish state-owned company. To be implemented the project has to be approved by the Danish authorities and the authorities of the Schleswig-Holstein state in Germany.

The studies for the project began in the nineties, it has been studied several variants, starting with a suspension bridge, followed by a cable-stayed bridge. As both bridge solutions received much opposition, especially from environmental organisations an immersed tunnel solution was also studied.

Thus, in early 2011, the Danish authorities took a preliminary decision to adopt an immersed tunnel as the “preferred solution”. The “tunnel group” also developed a TBM tunnel solution (Basic TBM tunnel solution), but as it is composed of three tubes, despite having less environmental impact than an immersed tunnel, was rejected because its estimated cost was higher [5]. At a later stage, significant weaknesses in the safety concept of the Immersed tunnel solution were noted.

The Immersed tunnel solution has since been submitted to public consultation of the EIA (Environmental Impact Assessment) in Denmark and the German state of Schleswig-Holstein. Despite criticisms, received approval from the Danish authorities, but in Germany is facing a lot of opposition and was forced to corrections which are hardly likely to be achieved. New public consultation of the EIA will thus be conducted but the result of the approval process is uncertain. In addition, it is facing financial set-backs, since the contractor bids received in 2014, although reduced after recent negotiations, increased the cost to about EUR 6500 million, while the funds provided by the EU have been reduced to EUR 600 million, much less than it was expected. Although the repayment period is now 36 years, the financial feasibility of the project is still doubtful.

Meanwhile, the Author developed two innovative and very cost-effective concepts for the construction of tunnels, the TMG and TMF concepts for rail and road tunnels respectively. The TMF concept obtained European patent in 2011 [4] and the TMG concept is European patent pending [3].